

## ELECTRICAL BOX MOUNTING ASSEMBLY

### FIELD OF THE INVENTION

1) This invention relates to electrical junction boxes and specifically to an electrical  
5 box mounting assembly for mounting a fan or light fixture to a ceiling.

### BACKGROUND OF THE INVENTION

2) Electrical boxes are commonly mounted on ceilings for the purpose of supporting  
ceiling fans, light fixtures, or other electrical devices. The electrical box provides a safe  
10 enclosure to house all wiring connections. Typically, these electrical boxes are secured to  
the ceiling by a supporting device that spans between two adjacent ceiling joists.

3) Various considerations are necessary in providing supporting devices for ceiling-  
mounted electrical boxes. The National Electrical Code specifies a maximum weight of  
80 pounds for ceiling light fixtures and a maximum weight of 70 pounds for ceiling fans.  
15 It is therefore very important that an installer use adequate load-bearing fasteners for  
securing the supporting device to the overhead joists. It is also important that the load be  
carried by the supporting device, and not by the electrical box.

4) A second consideration arises from the awkwardness of working overhead.  
Typically, when securing a supporting device and an electrical box to the overhead  
20 structure of the ceiling, several separate items must be manipulated. These include the  
mounting bar, the electrical box, the fasteners for securing the mounting bar to the ceiling  
structure, and the fasteners for mounting the electrical box to the mounting bar.

Considering that the installer is typically on a ladder, this creates a challenging task for

any installer. It is therefore imperative that all parts necessary for a successful installation are on hand for the installer.

5) Another consideration is that the support device must be matched to an electrical box. Many supporting devices are meant to accommodate most commercial electrical boxes. This typically requires complex arrangements on the supporting device to accommodate a variety of boxes.

6) Many supporting devices for ceiling fans and fixtures include an arrangement to temporarily secure the device to the ceiling joists including U.S. Patent 5,934,631 to Becker, et al., U.S. Patent 5,954,304 to Jorgensen, U.S. Patent 5,938,157 to Reiker, and U.S. Patent 6,098,945 to Korcz, and U.S. Patent 6,332,597 to Korcz et al.

10) Although all of the above supporting devices include an arrangement for temporarily fastening the supporting device to overhead joists to free up an installer's hands, they are still not completely satisfactory for simplifying the remainder of the task for installing the electrical box and the light fixture or fan to the supporting device.

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## SUMMARY OF THE INVENTION

8) The invention is an adjustable mounting bar and electrical box assembly for hanging a light fixture, fan, or other electrical device from a ceiling. All hardware required for mounting the electrical device is included with the assembly. The adjustable mounting bar includes sliding tubular members with end flanges for spanning between adjacent overhead joists. An electrical box is connected to the tubular members by a clamp and outer clamping fasteners, which can be loosened to adjust the length of the adjustable mounting bar. The end flanges include penetrable tabs that can be driven into

the overhead joists to temporarily secure the adjustable mounting bar to the joists and thereby free the installer's hands. First load bearing fasteners are threadably engaged in first storage receptacles in the sliding tubular members of the assembly and upon temporary securement to the joists, can be removed from the storage receptacles and

5 fastened through the end flanges to securely fasten the mounting bar to the joists. The assembly includes second load bearing device fasteners that are threadably engaged in second storage receptacles in the electrical box. After the mounting bar is secured to the joists and the electrical box is secured to the mounting bar, the device fasteners can be removed from the second storage receptacles and an electrical device brought into

10 engagement with the lower edge of the electrical box. The device fasteners are then driven into receptacles in the clamp. Oversize openings are provided in the top wall of the electrical box to ensure that the entire suspended load is borne by the clamp and mounting bar and not the electrical box.

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## OBJECTS AND ADVANTAGES

9) The electrical box mounting assembly of the present invention provides a complete mounting assembly for mounting an electrical device to a ceiling, including all of the required fastening hardware. All of the installation hardware that is required to complete the task is provided as a part of the mounting assembly, including all required  
20 fasteners.

10) An additional advantage is that the required fasteners are held securely in the electrical box mounting assembly in temporary storage receptacles. The temporary storage receptacles provide an advantage in that the fasteners are held securely in the

assembly until they are ready to be used. The required fastening hardware is therefore on hand for installation at the time it is required. By freeing up an installer's hands, the task of mounting an electrical device to a ceiling is therefore greatly simplified and the installation time greatly reduced. Additionally, by having all of the required fastening

5 hardware on hand, the installer is not burdened by the task of locating appropriate fasteners at the appropriate time.

11) The electrical box mounting assembly also provides the advantage that all of the load is supported by the supporting bars and the clamp, and not by the electrical box itself.

10 12) A further advantage is that the fastening hardware, while in storage in the temporary storage receptacles, does not extend beyond the outer periphery of the bars and end flanges.

13) These and other objects and advantages of the present invention will be better understood by reading the following description along with reference to the drawings.

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#### **DESCRIPTION OF THE DRAWINGS**

14) Fig. 1 is a perspective view of a preferred embodiment of an adjustable mounting bar and electrical box assembly according to the present invention.

15) Fig. 2 is a bottom view of two tubular members that will be fitted together to form  
20 an adjustable mounting bar according to the present invention.

16) Fig. 3 is a side view of the two tubular members of Fig. 2.

17) Fig. 4 is a bottom view of the two tubular members of Fig. 3 after they are fitted together to form the adjustable mounting bar of the present invention.

- 18) Fig. 5 is a cross-sectional view of the adjustable mounting bar taken along line 5-5 of Fig. 2.
- 19) Fig. 6 is a perspective view of the electrical box portion of the adjustable mounting bar and electrical box assembly of Fig. 1.
- 5 20) Fig. 7 is a top view of the electrical box shown in Fig. 8.
- 21) Fig. 8 is a side view of the electrical box shown in Fig. 8.
- 22) Fig. 9 is a perspective view of a clamp that is part of the adjustable mounting bar and electrical box assembly of the present invention.
- 23) Fig. 10 is a plan view of the flat plate portion of the clamp of Fig. 9.
- 10 24) Fig. 11 is a cross-sectional view of the adjustable mounting bar taken along line 11-11 of Fig. 12.
- 25) Fig. 12 is side view of the adjustable mounting bar and electrical box assembly of Fig. 1.

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**Table of Nomenclature**

- 26) The following is a listing of part numbers used in the drawings along with a brief description:

	<u>Part Number</u>	<u>Description</u>
20	20	electrical box mounting assembly
	22	adjustable mounting bar
	24	inner tubular member
	26	outer tubular member
	28	electrical box
25	30	outer end of inner tubular member
	32	inner end of inner tubular member
	34	outer end of outer tubular member
	36	inner end of outer tubular member

	38	bottom sides of tubular members
	40	longitudinal slot
5	42	lip
	44	end flange
	46	top wall of electrical box
	48	top surface of top wall
	50	side walls of electrical box
	52	bottom edge of side walls
	54	knockout areas
10	56	clamp
	58	flat bar
	60	outer clamping member
	62	outer aperture in flat bar
	64	inner aperture in flat bar
15	66	middle aperture in outer clamping member
	68	inner threaded bore in outer clamping member
	70	planar portion of outer clamping member
	72	upturned edge
	73	first fastener
20	74	outer clamping fastener
	76	oversized opening in top wall of electrical box
	78	receptacle
	80	aperture in flange
	82	inner face of flange
25	84	V-shaped tab
	86	joist
	88	first temporary storage receptacle
	90	second temporary storage receptacle
	92	bar fastener
30	94	device fastener
	98	outer edge of flange
	100	mounting ring
	102	electrical device
	104	bent over portion of bottom edge of electrical box
35	106	alignment apertures
	108	side portion of rectangular cross section
	110	top surface of lip
	112	aperture in top wall of electrical box for first fastener
	114	aperture in top wall of electrical box for device fastener
40	116	grounding aperture
	118	grounding screw

**DETAILED DESCRIPTION OF THE INVENTION**

- 27) Referring to Fig. 1, there is depicted an electrical box mounting assembly 20 for securing an electrical device (not shown), such as a light fixture or a fan, to a ceiling. The electrical box mounting assembly 20 includes an adjustable mounting bar 22 including an inner 24 and an outer 26 tubular member, and an electrical box 28.
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- 28) Referring to Figs. 2-5, the inner tubular member 24 has an outer end 30 and an inner end 32. The outer tubular member 26 also has an outer end 34 and an inner end 36. Both of the tubular members 24, 26 have rectangular cross sections.
- 29) As shown in Fig. 5, the inner tubular member 24 has a smaller rectangular cross section than the outer tubular member 26, thereby enabling the inner tubular member 24 to be received in and slide with respect to the outer tubular member 26.
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- 30) With reference to Fig. 2, the bottom sides 38 of each tubular member 24, 26 include longitudinal slots 40. Lips 42 surround the slots 40 and extend longitudinally along the bottom sides 38. Each of the tubular members 24, 26 include an end flange 44 on their outer ends 30, 34.
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- 31) Referring to Figs. 6-8, the electrical box 28 used with the electrical box mounting assembly of the present invention includes a top wall 46 having a top surface 48 and side walls 50 having a bottom edge 52. The electrical box 28 may include knockout areas 54 which may be later removed as desired to allow for passage of wiring there through.
- 32) With reference to Figs. 9-10, a clamp 56 is depicted. The clamp 56 includes a flat bar 58 and an outer clamping member 60. The flat bar 58 includes outer 62 and inner 64 apertures that align with middle 66 aperture and inner threaded bore 68 in the outer
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clamping member 60. Outer clamping member 60 includes a planar portion 70 and upturned edges 72 at a 90 degree angle to the planar portion 70.

- 33) Referring to Figs. 1 and 11, the outer clamping member 60 is secured to the top surface 48 of the electrical box 28 by first fasteners 73 through aperture 112 in the top wall 46 of the electrical box 48 and secured into the inner threaded bores 68 in the outer clamping member 60. Outer clamping fasteners 74 connect the outer clamping member 60 to the flat bar 58 with the lips 42 of the bottom side 38 of the tubular members 24, 26 sandwiched there between. The flat bar 58 therefore is disposed within the inner tubular member 24 and rests on the lips 42 of the inner tubular member 24. With the outer 10 clamping fasteners 74 loosely holding the outer clamping member 60 to the flat bar 58, the inner tubular member 24 can be easily slid within the outer tubular member 26 thereby adjusting the adjustable mounting bar 22 to the desired length. Since the outer clamping member 60 has already been secured tightly to the electrical box 28, once the adjustable mounting bar 22 has been adjusted to the desired length, the electrical box 28 15 can be adjusted to the desired position on the mounting bar 22 whereupon the outer clamping fasteners 74 can be tightened into the flat bar 58 to lock the adjustable mounting bar 22 to the desired length and also lock the electrical box 28 in the desired position. Two outer clamping fasteners 74 are typically used. The top wall 46 of the electrical box 28 includes oversized openings 76 sized larger than the head of the outer 20 clamping fasteners 74, therefore allowing the electrical box 28, after initial mounting, to be removed from the adjustable mounting bar 22 without changing its length. The oversized openings 76 also insure that all of the weight of a suspended device is borne by the flat bar 58 and the tubular members 24, 26 and not by the electrical box 28, which, as

a result of the oversized openings 76, escapes contact with the outer clamping fastener 74 and therefore does not support any of the suspended load. As shown in Fig. 9, the outer clamping member 60 further includes receptacles 78, the function of which will be explained herein.

5 34) Referring to Figs. 1 and 12, the end flanges 44 of the inner 24 and outer 26 tubular members include apertures 80, an inner face 82, and a V-shaped tab 84 bent from the inner face 82 such that the tab 84 can be later hammered outwards to temporarily secure the adjustable mounting bar 22 to the joists 86.

35) A distinguishing feature of the preferred embodiment of the electrical box 10 mounting assembly 20 is the inclusion of prepackaged fasteners to simplify its installation. The prepackaged fasteners are held in temporary storage receptacles to make them readily available to the installer at the time of installation. As can be readily appreciated by anyone who has installed an overhead light fixture or fan, the fact that all the work is overhead and the installer is typically on a ladder, makes the installation 15 challenging. One of the most difficult aspects of the installation is freeing ones hands to obtain the various fasteners, making sure to obtain the correct fastener, handling the fastener and screwdriver, and inserting the fastener while keeping the fan or light fixture in the proper position. To ease the installation task the electrical box mounting assembly 20 therefore includes a first temporary storage receptacle 88 on the outer ends 30, 34 of 20 the tubular members 24, 26 as shown in Fig. 1 and two or more second temporary storage receptacles 90 in the top wall 46 of the electrical box 28 as shown in Figs. 6-8. Prepackaged fasteners, as shown in Fig. 1, are stored in the temporary storage receptacles

88, 90 and include a bar fastener 92 secured in the first temporary storage receptacle 88 and a device fastener 94 secured in the second temporary storage receptacle 90.

36) The electrical box mounting assembly 20 is typically supplied as shown in Fig. 1 but with the adjustable mounting bar 22 adjusted to its shortest length. As shown in Fig. 5 11, the outer clamping fasteners 74 are typically secured tightly to the flat bar 58 to lock the electrical box mounting assembly 20 to its shortest length. As supplied, the electrical box 28, referring to Fig. 1, is held tightly to the adjustable mounting bar 22, the bar fasteners 92 are held tightly in the first temporary storage receptacles 88, and the device fasteners 94 are held tightly in the second temporary storage receptacles 90. The device 10 fasteners 94 are typically screws and the second temporary storage receptacles 90 are typically threaded bores. The device fasteners 94 are typically threaded into the second temporary storage receptacles 90 to a position in which the heads of the device fasteners 94 reside within the box and do not extend beyond a plane intersecting the bottom edge 52 of the electrical box 28. The bar fasteners 92 typically do not extend beyond the outer 15 edge 98 of the end flanges 44. The electrical box mounting assembly 20 is therefore supplied in the smallest profile possible, with the bar fasteners 92 and device fasteners 94 not extending beyond the lateral extent of the electrical box 28 or the end flanges 44. For shipment, storage, and sale the electrical box mounting assembly 20 as supplied can be easily packaged within a rectangular packaging container without any fear of the 20 prepackaged fasteners 92, 94 snagging or catching on the container or of loosening or dislodging from the first 88 and second 90 temporary storage receptacles. Alternatively, the electrical box 28 could be packaged and sold separately of the adjustable mounting bar 22, for example, to allow the consumer to choose an electrical box of a specific depth

or shape, in which case the adjustable mounting bar 22 with the bar fasteners 92 temporarily stored therein would be packaged separately of the electrical box 28 with the device fasteners temporarily 94 stored therein. The explanation of the operation of the electrical box mounting assembly 20 that follows assumes the electrical box mounting 5 assembly 20 is sold as a unit, with the electrical box 28 temporarily secured to the adjustable mounting bar 22.

37) To place the electrical box mounting assembly 20 in operation, a suitable location is found on a ceiling. Referring to Figs. 1 and 12, the outer clamping fasteners 74 are loosened, allowing the adjustable mounting bar 22 to be adjusted in length and further 10 allowing the electrical box 28 to be slid along the length of the adjustable mounting bar 22 to the desired location. The adjustable mounting bar 22 is adjusted to accommodate the distance between adjacent overhead joists 86 and the electrical box 28 is slid to the desired position on the mounting bar 22. The outer clamping fasteners 74 are then tightened to lock the electrical box 28 to the mounting bar 22 and to lock the adjustable 15 mounting bar 22 to its desired length to span the joists 86. At this point in the installation procedure, the installer's hands are free and all of the required installation hardware is contained with the electrical box mounting assembly 20 in the form of the prepackaged fasteners 92, 94. The installer then lifts the electrical box mounting assembly 20 into the desired position between the joists 86 and hammers the V-shaped tabs 84 into the joists 20 86 to temporarily hold the mounting assembly 20 to the joists. The installers hands are then free to remove the bar fasteners 92 one at a time and secure them through the flange apertures 80 and into the joists 86. As shown in Fig. 1, a most preferred embodiment of the electrical box mounting assembly 20 includes four bar fasteners 92. The bar fasteners

92 are load bearing fasteners that are rated to hold an 80 pound ceiling light fixture or a 70 pound ceiling fan as specified by the National Electrical Code. After the bar fasteners 92 have been installed, the installer's hands are again free to proceed with the installation. The device fasteners 94, which are held tightly in the second temporary storage

5      receptacles 90, may then be removed, the mounting ring 100 of an electrical device 102, such as a ceiling fan or light fixture, lifted in alignment with the bottom edge 52 of the electrical box 28, and the device fasteners 94 threaded into the receptacles 78 to suspend the electrical device 102 from the electrical box mounting assembly 20. The receptacles 78 are typically threaded bores within the outer clamping member 60 to accept the device

10     fasteners 94.

38) Referring to Figs. 6 and 9, the bottom edge 52 of the electrical box 28 includes bent over portions 104 having alignment apertures 106 therein, the alignment apertures 106 situated to be in vertical alignment with the receptacles 78 in the outer clamping member 60.

15    39) With reference to Fig. 12, prior to tightening the device fasteners 94, wiring connections (not shown) can be completed between the housing electrical supply and the electrical device 102. Once wiring connections are completed, the device fasteners 94 are tightened to secure the electrical device 102 to the electrical box mounting assembly 20.

40) With reference to Fig. 5, it should be noted that the rectangular cross sections of  
20    the tubular members 24, 26 include side portions 108 and the bottom sides 38 of the tubular members 24, 26 are at a non-oblique angle to the side portions 108. The lips 42 of both the inner 24 and outer 26 tubular members include a top surface 110 that is smooth to allow the inner tubular member 24 to slide smoothly upon the outer tubular member 26

and to also allow the flat bar (not shown) to slide smoothly upon the lips 42 of the inner tubular member 24. As shown in Fig. 5, the lips 42 on the bottom side 38 of the tubular members 24, 26 are at a non-oblique angle to the side portions 108.

41) Referring to Fig. 12, it is critical that several dimensions and materials of

5 construction are maintained within specifications to support the weight of the electrical box mounting assembly 20 and the electrical device 102 suspended there from. The inner 24 and outer 26 tubular members, the electrical box 28, the outer clamping member 60, and the flat bar 58 are typically constructed from steel to resist torsional bending and strain from the suspended electrical device 102. The steel pieces are typically zinc-plated 10 to make them rust resistant. The wall thickness of the tubular members 24, 26 is typically at least 0.038 inch. The flat bar 58 is at least 0.120 inch thick. The outer clamping member 60 is at least 0.050 inch thick.

42) With reference to Figs. 1 and 12, the end flanges 44 are preferably at a 90 degree

angle to the tubular members 24, 26 and the flanges 44 on each tubular member 24, 26

15 are of equal lengths. The bar fastener 92 will be load-bearing and is preferably a self-tapping machine screw no smaller than a #10 and no less than 1 inch in length. To accommodate the self-tapping machine screw bar fastener 92, the first temporary storage receptacle 88 is preferably a circular aperture with a diameter of 0.172 inch. The size of the device fastener 94 would vary in length depending on the size of the electrical box 28, 20 but is preferably a 10-32 screw no less than 2.5 inches in length for an electrical box with a side wall of length 1.590 inch. The second temporary storage receptacles 90 are preferably threaded bores in the top wall 46 of the electrical box 28 threaded to match the threads on the device fastener 94.

- 43) Referring to Figs. 6-8, the top surface 48 of the electrical box 28 typically is planar. The preferred embodiment of the top wall 46 includes the second temporary storage receptacles 90 which are threaded bores that will accept device fasteners 94, two apertures 112 that will accept first fasteners 73, oversized openings 76 to accommodate 5 the outer clamping fasteners 74, apertures 114 to accommodate the device fasteners 94 when they are moved from the second temporary storage receptacles 90 to their receptacles, and a grounding aperture 116 which is a threaded bore to accept a grounding screw 118.
- 44) Having thus described the invention with reference to a preferred embodiment, it 10 is to be understood that the invention is not so limited by the description herein but is defined as follows by the appended claims.